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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/079,292	02/20/2002	Naoya Hasegawa	9281-4288	6615

7590 09/30/2005  
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EXAMINER

MAGEE, CHRISTOPHER R

ART UNIT PAPER NUMBER

2653

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/079,292	<b>Applicant(s)</b> HASEGAWA ET AL.	
	<b>Examiner</b> Christopher R. Magee	<b>Art Unit</b> 2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-25, 77 and 78 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16, 21, 22 and 78 is/are rejected.
- 7) ☒ Claim(s) 17-20, 23-25 and 77 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/24/2005</u> . | 6) <input type="checkbox"/> Other: _____  |

*by*

**DETAILED ACTION**

***Response to Amendment***

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-13, 21, 22 and 78 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill (US 6,456,469 B1) in view of Lee et al. (hereinafter Lee) (US 5,731, 936).

- Regarding claims 1-5, Gill teaches a spin valve sensor with a seed layer [408] formed on top of the substrate [406] [col. 6, lines 65-67];

an antiferromagnetic layer [410], and

a ferromagnetic layer [414],

the seed layer [408], the antiferromagnetic layer [410], and the ferromagnetic layer [414] being deposited in that order from the bottom, magnetization of the ferromagnetic layer being directed in a predetermined direction by an exchange coupling magnetic field produced at an interface between the antiferromagnetic layer and the ferromagnetic layer [Fig. 5; col. 7, lines 42-57], a thickness of the seed layer is 10 to 200 Å [col. 7, lines 10-11], and a crystal structure of the seed layer is a face-centered cubic structure [col. 7, lines 2-9].

Gill does not show a nonmagnetic seed layer comprising  $\alpha$  and Cr,  $\alpha$  being at least one of Fe, Ni, and Co, wherein a Cr content of the seed layer is 35 to 60 atomic percent.

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Lee discloses a nonmagnetic seed layer comprising  $\alpha$  and Cr,  $\alpha$  being at least one of Fe, Ni, and Co, wherein a Cr content of the seed layer is 35 to 60 atomic percent [col. 6, lines 15-24].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the spin valve sensor of Gill with a nonmagnetic seed layer comprising  $\alpha$  and Cr,  $\alpha$  being at least one of Fe, Ni, and Co, wherein a Cr content of the seed layer is 35 to 60 atomic percent as taught by Lee.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the spin valve sensor of Gill with the seed layer as taught by Lee in order to increase the thermal stability so that the sense current can be increased [Lee; col. 2, lines 46-50].

- Regarding claim 6, Gill discloses the thickness of the seed layer is at most 80 Å [col. 7, lines 10-11].
- Regarding claim 7, Gill discloses the thickness of the seed layer is at most 60 Å [col. 7, lines 10-11].
- Regarding claims 8-11, Gill shows all the features, *supra*, but does not disclose the seed layer comprises one of a NiFeCr alloy and a NiCr alloy, wherein the seed layer has a composition represented by  $(\text{Ni}_{100-x}\text{Fe}_x)\text{-Cr}$ , and an atomic ratio  $x$  satisfies the relationship  $0 \leq x \leq 70$ ,  $0 \leq x \leq 50$  or  $0 \leq x \leq 30$ .

Lee teaches a seed layer comprises one of a NiFeCr and a NiCr alloy, wherein the seed layer has a composition represented by  $(\text{Ni}_{100-x}\text{Fe}_x)\text{-Cr}$ , and an atomic ratio  $x$  satisfies the relationship  $0 \leq x \leq 70$ ,  $0 \leq x \leq 50$  or  $0 \leq x \leq 30$  [col. 2, lines 52-63; col. 6, lines 15-24].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the spin valve sensor of Gill with a seed layer as taught by Lee.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the spin valve sensor of Gill with the seed layer as taught by Lee in order to increase the thermal stability so that the sense current can be increased [Lee; col. 2, lines 46-50]. Plus, the improvement results in larger grains with fewer defects, which contributes to increasing the MR coefficient of the MR stripe [Lee; col. 2, line 64 to col. 3, line 2].

- Regarding claims 12 and 13, Gill discloses all the features, *supra*, but does not teach an underlayer formed below the seed layer and comprising at least one element selected from Ta, Hf, Nb, Zr, Ti, Mo and W, wherein the seed layer is formed by sputtering.

Lee discloses an underlayer formed below the seed layer and comprising at least one element selected from Ta, Hf, Nb, Zr, Ti, Mo and W [col. 2, lines 51-54], wherein the seed layer is formed by sputtering [col. 5, lines 41-56].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the spin valve sensor of Gill with an underlayer formed below the seed layer as taught by Lee.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the spin valve sensor of Gill with an underlayer formed below the seed layer as taught by Lee in order to increase the MR coefficient of the magnetoresistive element [Lee; col. 2, lines 51-54].

- Regarding claim 21, Gill teaches the antiferromagnetic layer comprises X and Mn, wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru, and Os [col. 7, lines 15-20].

- Regarding claims 22 and 78, Gill teaches the antiferromagnetic layer comprises X-Mn-X' alloy, wherein X is at least one element selected from the group consisting of Pt, Pd, Ir, Rh, Ru, and Os, and X' is at least one element selected from the group consisting of Ne, Ar, Kr, Xe, Be, B, C, N, Mg, Al, Si, P, Ti, V, Cr, Fe, Co, Ni, Cu, Zn, Ga, Ge, Zr, Nb, Mo, Ag, Cd, Ir, Sn, Hf, Ta, W, Re, Au, Pb, and rare-earth elements. [col. 7, lines 15-20].

2. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gill (US 6,456,469 B1) and Lee et al. (hereinafter Lee) (US 5,731, 936), as applied to claim 1 above and further in view of Ohta et al. (hereinafter Ohta) (US 5,958,611).

- Regarding claims 14-16, Gill and Lee disclose all the features, *supra*, but do not disclose an average grain size in a direction parallel to a layer surface in each layer formed on the seed layer is at least 100 Å.

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Ohta teaches a crystal grain size D of composition forming the oxide antiferromagnetic layer [50] in the range of 10 to 40 nm (i.e., 100 to 400 Å), more preferably 20 to 40 nm [col. 8, lines 1-4].

It would have been obvious to one of ordinary skill in the art at the time the invention was made to set the average grain size of each layer of Gill and Lee within the parameters as taught by Ohta.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to set the average grain size of each layer of Gill and Lee within the parameters as taught by Ohta in order to obtain a sufficiently large exchange biasing magnetic field [Ohta; col. 4, lines 38-40].

#### ***Allowable Subject Matter***

3. Claims 17-20, 23-25 and 77 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

4. Applicant's arguments filed 7/13/2005 have been fully considered but they are not persuasive.

In response to applicant's argument regarding claims 1-13, 21, 22 that Gill (US 6,456,469 B1) and Lee et al. (US 5,731, 936) are nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably

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pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Gill '469 and Lee '936 exist in the applicant's field of endeavor (i.e., the art of MR sensors). It is well known to one of ordinary skill in the art that exchange coupled devices or spin valve sensors are types of MR sensors. Therefore the rejection of claims 1-13, 21, 22 is maintained.

Referring to claims 14-16, Ohta teaches a crystal grain size D of composition forming the oxide antiferromagnetic layer [50] in the range of 10 to 40 nm (i.e., 100 to 400 Å), more preferably 20 to 40 nm [col. 8, lines 1-4]. The prior art reference addresses the metes and bounds of the claim and therefore the rejection of claims 14-16 is upheld.

### *Conclusion*

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Magee whose telephone number is (571) 272-7592. The examiner can normally be reached on M-F, 8: 00 am-5: 30 pm.

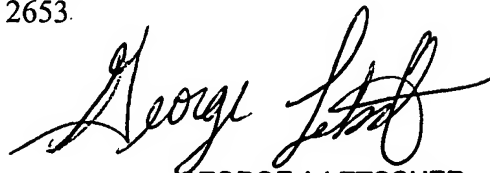
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (571) 272-7589. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christopher R. Magee  
Patent Examiner  
Art Unit 2653.

September 28, 2005  
crm



GEORGE J. LETSCHER  
PRIMARY EXAMINER